DRAWING AMENDMENTS

The attached sheets of drawings include a designation of the original drawing as Fig. 1 and a new Fig. 2. These sheets replace the original sheet including the single figure. In Fig. 2, previously non-illustrated elements have been shown.

Please approve the drawing changes that are marked in red on the accompanying "Annotated Sheets Showing Changes" of Figs. 1 and 2. Formal "Replacement Sheets" of Figs. 1 and 2 are also enclosed.

Attachments: Replacement Sheets

Annotated Sheets Showing Changes

REMARKS/ARGUMENTS

Reconsideration of the application is requested.

On December 19, 2003 Applicants filed a claim for priority under 35 U.S.C. § 119(a)-(d) and a certified copy of German Patent Application 102 53 919.7, filed November 19, 2002. However, the appropriate boxes 12), 12a) and 12a1. of the Office Action Summary were not checked. Applicants would appreciate receiving acknowledgement of the claim for priority and certified priority document in the next Office communication.

Claims 1-6 and 9-12 are now in the application and are subject to examination. Claim 1 has been amended. No claims have been added. Claims 7 and 8 have been canceled.

In "Claim Objections" on page 2 of the above-identified Office Action, the Examiner objected to the drawings as not showing the exposure appliance and required that it be added to the drawings or canceled from the claims. The Examiner's suggested correction has been made by adding a new Fig. 2 showing the exposure appliance. The original figure has been labeled as Fig. 1 and brief and detailed descriptions of the figure have been added.

In "Claim Rejections - 35 USC § 102" on pages 3-5 of the Office Action, claims 1-5, 7 and 8 have been rejected as being fully anticipated by U.S. Patent No. 6,411,387 to Kaneko et al. (hereinafter Kaneko) under 35 U.S.C. § 102(b).

In "Claim Rejections - 35 USC § 103" on pages 5-6 of the Office Action, claim 9 has been rejected as being obvious over Kaneko under 35 U.S.C. § 103(a).

The rejections have been noted and claim 1 has been amended in an effort to even more clearly define the invention of the instant application. Support for the changes is found in original claims 7 and 8 of the instant application.

As will be explained below, it is believed that original dependent claims 7 and 8 and independent claims 11 and 12 were patentable over the cited art in their original form.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful. Claim 1 calls for, *inter alia*, a method for adjusting a substrate in an exposure appliance used for transferring a structure to the substrate, the appliance including a moving chuck for aligning the substrate, a

radiation source, and at least one focusing device, the method which comprises:

for at least one first position on the chuck, obtaining a measured discrepancy by measuring any discrepancy between a surface of the chuck and an idealized plane indirectly by measuring discrepancies between a surface of a highly planar test substrate and an idealized plane, using at least one focus/tilt sensor in an exposure appliance;

providing the substrate, which is covered with a photosensitive layer;

fixing the substrate on the chuck such that the surface of the chuck faces and the substrate and the chuck contacts the substrate;

selecting a first detail from a plurality of details in the photosensitive layer, the first detail representing a first exposure area on the substrate, the selecting step including defining a projected first position by projecting the first position on the chuck into the photosensitive layer and selecting the first detail such that the projected first position is located within or near the first detail;

obtaining a predetermined focus distance by predetermining a common focus distance intended for the plurality of details on the substrate;

calculating a first correction for the predetermined focus distance between the first detail on the substrate and the focusing device as a function of the measured discrepancy at the first position; and

applying the first correction to the focus distance by moving the chuck for adjusting the substrate in an exposure step for the first exposure area.

Independent claim 11 calls for, *inter alia*, a method for adjusting a substrate in an exposure appliance used for transferring a structure to the substrate, the appliance including a moving chuck for aligning the substrate, a

radiation source, and at least one focusing device, the method which comprises:

for at least one first position on the chuck, obtaining a measured discrepancy by measuring any discrepancy between a surface of the chuck and an idealized plane;

providing the substrate, which is covered with a photosensitive layer, on the chuck such that the surface of the chuck faces the substrate;

selecting a first detail from a plurality of details provided for measuring an ideal focus distance in the photosensitive layer, the first detail representing a first exposure area on the substrate, the selecting step including defining a projected first position by projecting the first position on the chuck into the photosensitive layer and selecting the first detail such that the projected first position is located within or near the first detail;

setting a predetermined limit value for a permissible discrepancy;

comparing the measured discrepancy with the predetermined limit value;

as a function of the comparing step, excluding a detail from the plurality of details provided for measuring the ideal focus distance in the photosensitive layer;

obtaining a measured ideal focus distance by measuring a focus distance being ideal for exposure in at least one further detail from the plurality of details; and

moving the chuck to adjust the substrate to the measured ideal focus distance for illuminating the first exposure area.

Independent claim 12 calls for, *inter alia*, a method for adjusting a substrate in an exposure appliance used for transferring a structure to the substrate, the appliance including a moving chuck for aligning the substrate, a

radiation source, and at least one focusing device, the method which comprises:

for at least one first position on the chuck, obtaining a measured discrepancy by measuring any discrepancy between a surface of the chuck and an idealized plane;

providing the substrate, which is covered with a photosensitive layer, on the chuck such that the surface of the chuck faces the substrate;

selecting a first detail including at least one first adjustment mark from a plurality of details in the photosensitive layer, the first detail representing a first exposure area on the substrate, the selecting step including defining a projected first position by projecting the first position on the chuck into the photosensitive layer and selecting the first detail such that the projected first position is located within or near the first detail;

setting a predetermined limit value for a permissible discrepancy;

comparing the measured discrepancy with the predetermined limit value;

as a function of the comparing step, not considering the adjustment mark in the first detail; and

based on at least one further adjustment mark, moving the chuck to adjust the substrate in a direction at right angles to a direction of a focus distance for illuminating the first exposure area.

The features of original claims 7 and 8 which have been added to claim 1 relate to the method step of measuring the discrepancy between the chuck surface and an idealized plane. According to the newly added limitations in claim 1, focus/tilt sensors of the exposure appliance are used to perform the measurement, wherein a highly planar test

substrate is employed to represent the chuck surface. Thus, an indirect measurement is performed with respect to the discrepancies.

It is noted that the focus/tilt sensors used to measure the discrepancies are those of the same exposure appliance, which is used to perform the exposure. In particular, an exposure is performed using sensors which carry out an initial global measurement of the focus distance (see page 13, lines 21 - 24, Fig. 1, step 16) prior to exposure of a substrate. The sensors are identical with the sensors used to perform the discrepancy measurement of the test substrate ("golden wafer"), which becomes clear from page 12, lines 8 - 19, and Fig. 1, step 10 (see the wording which refers to the sensors on page 13, line 22). In order to clarify the context, this feature (step 16 - the use of focus/tilt sensors) has been added to claim 1.

Fig. 1 of the Kaneko reference discloses a projection exposure apparatus 10 having a wafer stage 12 for a photosensitive substrate or wafer W. A projection optical system PL is disposed above the wafer stage 12 and a reticle R is disposed above the projection optical system PL. An illumination system 14 is provided for the reticle R and a main control unit 16 is provided for the projection exposure

apparatus 10. The wafer stage 12 has an XY-stage 18 and a material support 20, both of which are driven by a drive unit 22. A wafer holder 28 is mounted on the material support 20.

Kaneko provides a method of exposing the wafer W by using the exposure apparatus 10. The flatness of the material support 20 is determined by measuring a tilt or displacement (see column 11, lines 6-7) in a direction of the optical axis at multiple positions (see column 11, lines 9-12) of its surface. The displacements are stored at the instant of measurement and are later read out when an exposure of a wafer substrate is performed. Prior to each exposure, a height adjustment of the material support in a direction of the optical axis may be carried out to compensate for unevenness of the material support 20 as a result of movement of a stage (see column 4, lines 4-6).

Kaneko is silent about using focus/tilt sensors for determining discrepancies of the chuck surface with respect an idealized plane. Rather, displacements with respect to that plane are measured therein using an interferometer. As shown in Figs. 1 and 2 of Kaneko, an interferometer unit 26 is installed before each of a projection optical system PL and a focus detection system 32, 34 mounted to the exposure apparatus 10 (see column 10, lines 38-41). In particular,

the focus detection is not present in the apparatus when the displacement measurement is performed. As becomes clear from this configuration, the apparatus of Kaneko is incapable of measuring displacements using the same sensors as those used for the global focus measurement for a wafer, which stands in contrast to the subject matter presently claimed in the instant application.

Further, a reference mirror 38 replaces the wafer holder 28 and the wafer W deposited thereon during the measurement in Kaneko (see column 10, lines 47-50). The chuck according to the invention is in contact with the substrate during exposure (see the fourth paragraph of claim 1). Accordingly, in order for Kaneko to show some features of the invention of the instant application, it is the wafer holder 28 that would have to be measured for displacements in Kaneko instead of the material support 20.

In summary, Kaneko teaches measuring displacements of a material support instead of a chuck, and using interferometer sensors instead of focus/tilt sensors already available in an exposure apparatus.

The concept of enabling a larger exposure throughput while keeping the efforts for performing a measurement as simple as

possible, is not provided in Kaneko. According to the prior art, the exposure apparatus would have to be dismounted with respect to the projection optical system in order to achieve a flatness measurement, which would require great effort.

The invention further permits the use of components of the exposure apparatus which are already present, i.e., focus/tilt sensors, to determine the flatness of a test substrate which is representative of the chuck flatness due to suction. Kaneko measures the flatness of a material support through the use of a planar reference mirror 38 which cannot be sucked to the material support 20 as the wafer holder 28 is removed. Therefore, the reference mirror may not be that representative for the material support 20 as the test substrate ("golden wafer") for the chuck. Hence, the measurement quality is improved.

As a result, the subject matter of amended claim 1 is neither anticipated by nor obvious over Kaneko.

With regard to independent claims 11 and 12, Kaneko fails to show that a predetermined limit is set for a measured discrepancy, in response to which an exposure of a corresponding detail, or exposure field, is excluded, or a respective adjustment mark is excluded from being used to

adjust a substrate. Accordingly, claims 11 and 12 are also neither anticipated by nor obvious over Kaneko.

Incidentally, Applicants would like to inform the Examiner that a patent with the subject matter of claims 11 and 12 has been granted over the same Kaneko reference in the corresponding German patent application.

Clearly, Kaneko does not show:

> fixing the substrate on the chuck such that the surface of the chuck faces and the substrate and the chuck contacts the substrate, and obtaining a measured discrepancy by measuring any discrepancy between a surface of the chuck and an idealized plane indirectly by measuring discrepancies between a surface of a highly planar test substrate and an idealized plane, using at least one focus/tilt sensor in an exposure appliance, as recited in claim 1, or
>
> setting a predetermined limit value for a permissible discrepancy, comparing the measured discrepancy with the predetermined limit value, and as a function of the comparing step, excluding a detail from the plurality of details provided for measuring the ideal focus distance in the photosensitive layer or not considering the adjustment mark in the first detail as recited in claims 11 and 12,

of the instant application.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1, 11 or 12. Those claims are thus believed to be patentable over the art. The

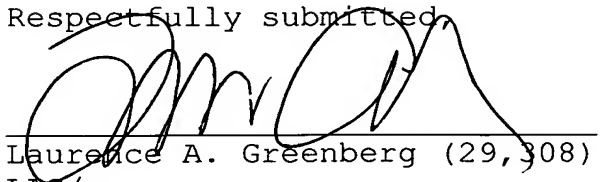
dependent claims are believed to be patentable as well because they all are ultimately dependent on claim 1.

In view of the foregoing, reconsideration and allowance of claims 1-6 and 9-12 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out.

If an extension of time is required, petition for extension is herewith made. Any extension fee therefor should be charged to the Deposit Account of Lerner Greenberg, Stemer LLP, No. 12-1099. Please charge any other fees due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner Greenberg Stemer LLP, No. 12-1099.

Respectfully submitted,



Laurence A. Greenberg (29,308)
LAG/am
March 14, 2006

Lerner Greenberg Stemer LLP
P.O. Box 2480
Hollywood, Florida 33022-2480
Tel.: (954) 925-1100
Fax: (954) 925-1101

1/2

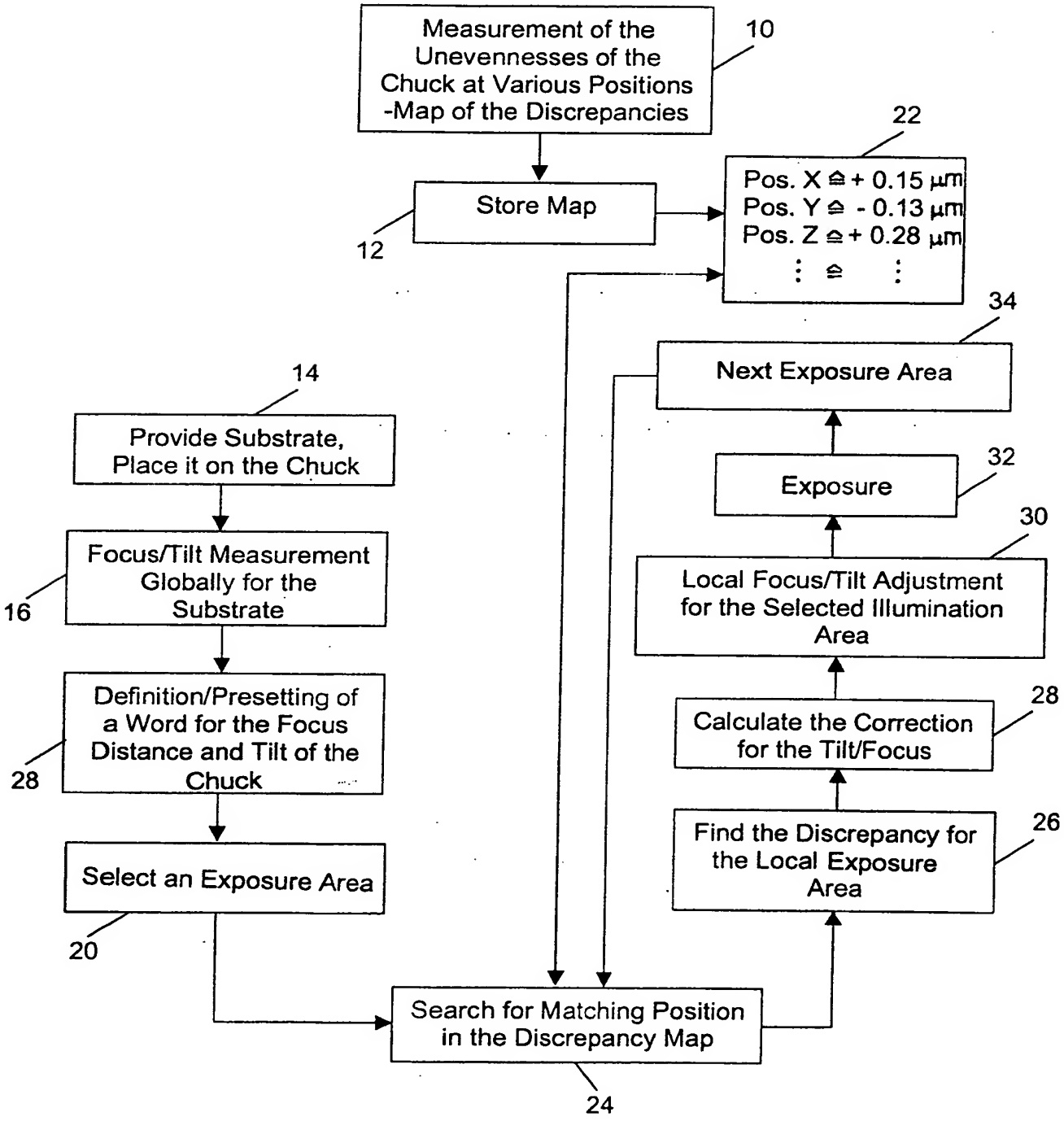
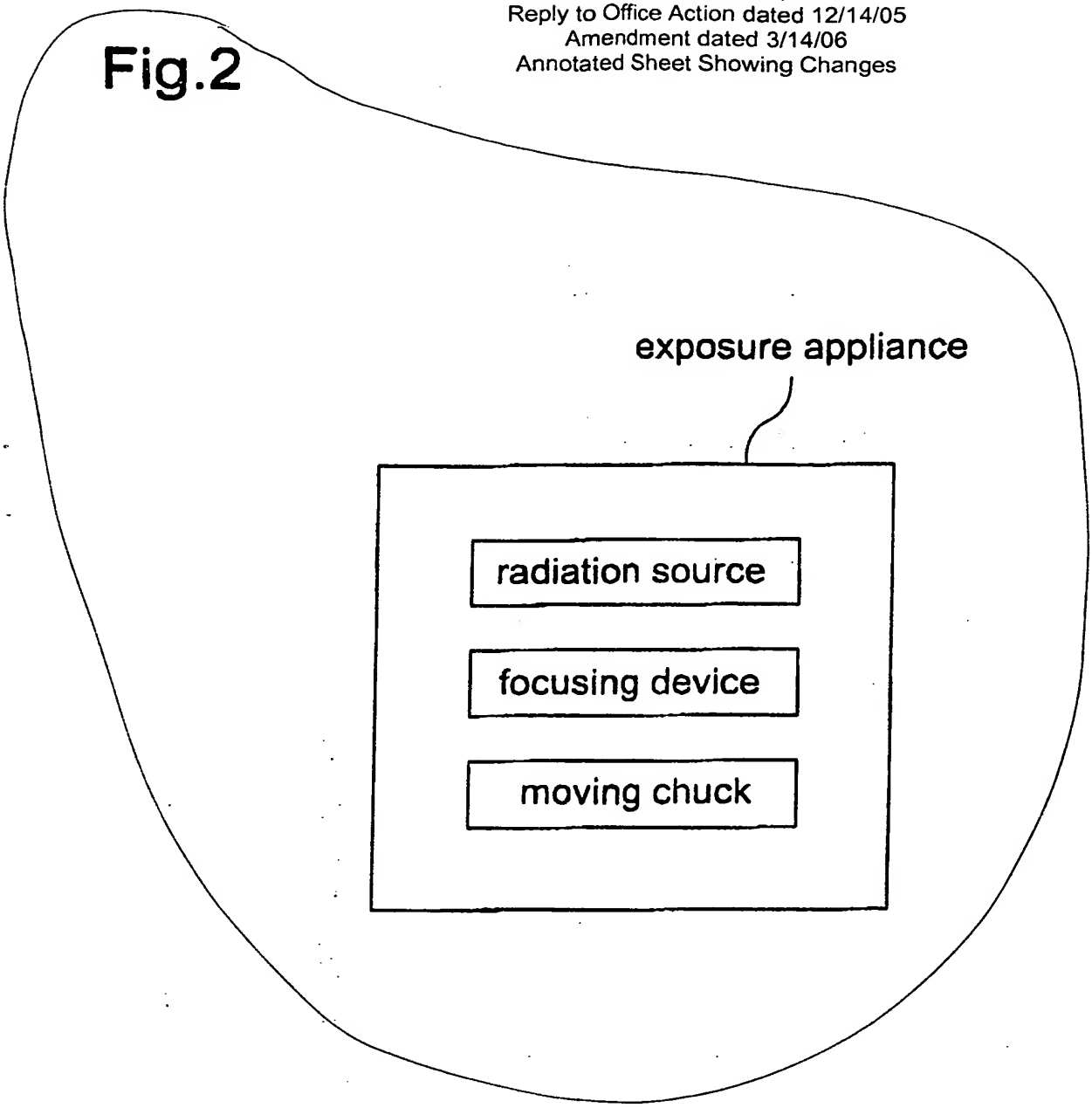

Measurement of the Unevennesses of the Chuck at Various Positions -Map of the Discrepancies
10
Store Map
12
22
Pos. X ≙ + 0.15 µm
Pos. Y ≙ - 0.13 µm
Pos. Z ≙ + 0.28 µm
34
Next Exposure Area
32
Exposure
30
Local Focus/Tilt Adjustment for the Selected Illumination Area
28
Calculate the Correction for the Tilt/Focus
26
Find the Discrepancy for the Local Exposure Area
14
Provide Substrate, Place it on the Chuck
16
Focus/Tilt Measurement Globally for the Substrate
28
Definition/Presetting of a Word for the Focus Distance and Tilt of the Chuck
20
Select an Exposure Area
24
Search for Matching Position in the Discrepancy Map

FIG. 1

Fig.2


exposure appliance
radiation source
focusing device
moving chuck